MARTHA KREBS TALKING POINTS - FUSION FORUM

• Secretary O'Leary has spoken very clearly to the importance of our fusion program as part of both our energy portfolio and our science portfolio. She has told you why our fusion science program is important, and will continue to be important as it makes the transition from a goal directed energy program to a fusion sciences program. I will discuss the progress we have made, where we are today, and where we are going.

• Last year, Congress cut our funding to $244M - over a 1/3 cut from FY95 - and charged us to change from a goal oriented energy program to a fusion science program. We were told to aim at improved fusion confinement concepts and development of low activation materials and to continue our current involvement in the design of ITER.

• Restructuring the program to respond to both the funding cut and the change in direction was extremely difficult. We acted immediately to adjust to the cut in budgets. The TPX - an advanced tokamak program at Princeton was terminated. Staff at Princeton was reduced by over 250 - 1/3 of the laboratory - and there were reductions at other laboratories and universities.

• Those were painful, but clearly necessary actions. The rest of the job - restructuring the program - was very hard, requiring many difficult choices Last fall, when we first faced this challenge, it wasn't clear how we could refashion a downsized fusion science program and maintain the support and commitment of a research community long dedicated to the different goals of our fusion energy program.

• We convened our Fusion Energy Advisory Committee, drawn from the industry, universities and our national laboratories, and asked them for a plan to restructure the program consistent with the Congressional direction. They - and the fusion community as a whole - performed remarkably. In less than two months, they put together a cohesive plan for the future of the program.

• Key elements of that plan include:

A shutdown of the TFTR a Princeton no later than mid-1998 after a brief program of D-T experiments. Full use of DIII-D and ALCATOR as facilities available to the entire fusion community.

A growing portfolio of small, but innovative new experiments, and a robust theory and modeling program.

A basic plasma sciences program

A continued commitment to our ITER design activities, and a potential commitment to ITER construction, but without an increase above our current ITER funding.

• We have a strong science base for the transition from last years program, which was aimed at producing a demonstration fusion reactor by 2025, to our current science based program. We can build on that base to identify a more efficient path for the eventual development of fusion as a commercial power source.

• Scientific progress has always been critical to progress in fusion research. Without that progress, there would have been no way to meet the challenge of confining a plasma in a magnetic field, heating it to over 100 million degrees, and keeping it from the inner wall of the containment vessel - only centimeters away.

• Secretary O'Leary pointed out the enormous increase that has been made in fusion power production since 1975. That increase is largely based on progress in fusion science.

In 1975, we had only a rudimentary understanding of high temperature plasma behavior. Our understanding is now quite sophisticated, and we are able to build complex computer models of many aspects of high temperature plasma behavior.

In 1975, we didn't understand the processes which transported energy out of the plasma. Although much work remains to be done in this area, we can now modify the plasma to create areas of stronger confinement which are more effective at retaining energy.

In 1975, we couldn't observe and measure what was taking place in the plasma without disturbing it. Today, we are world leaders in diagnostics, and can measure most internal plasma properties routinely.

In 1975, we could only heat plasmas to a few million degrees. Today, we have intense particle beams and high power microwave systems which produce plasma temperatures as high as 500 million degrees.

• In 1975, a fusion reaction could be sustained for less than 1/10 of a second, and produced a small fraction of a watt. Recent experiments at JET in Europe have lasted for approximately 1 minute, and we have produced over 10 million watts of fusion power at TFTR, although for less than a second.

• Also, over the last 20 years plasma science, which was in large part incubated by the fusion program, has become a distinct (but under funded) scientific discipline which is improving our understanding of phenomena in a wide range of areas, including astronomy, biology, chemistry and materials research.

• While we have made impressive progress in establishing a scientific base for a fusion energy program, there is much that remains to be done. We are restructuring to do it.

• A complete change in the program will take time, but by 2001, I expect that there will be a drastically different program than exists today:

-A DOE plasma science program will be under way at ~$10M, coordinated with NSF/NASA programs and contributing to US science and technology base

There will be a set of small to medium scale alternate concept experiments exploring plasma behavior at universities and laboratories

Princeton will still be a center for fusion science, including both innovative experiments and theory and modeling efforts, but at a scale smaller than TFTR.

DIII-D will have completed its study of improved tokamak confinement at higher plasma temperatures over longer pulse lengths. A new medium scale alternate will be in construction at that facility

ITER will be under construction, primarily funded by Japan & Europe. Our contribution will be in science-based niche areas where we have unique strengths, such as diagnostics or computation.

• We are taking steps toward that program.

We are continuing with the ITER program, but our contribution has been reduced and will stay roughly flat even if we participate in construction.

The way we manage our program is changing to be more inclusive of the fusion science community and we are taking steps to widen university participation.

Our current facilities are beginning to operate more as large scientific facilities for the entire U.S. fusion community, performing experiments based on scientific merit, rather than based on contribution to early fusion reactor development. Their goal is to explore the physics of high temperature confined plasmas, with experimental priorities set by broad based Program Advisory Committees, and broad scientific community involvement, as in our high energy physics program.

Our advisory committee is now reviewing these facilities to determine how to obtain optimum scientific benefit from our capital investment in them in their remaining useful life. In particular, it is establishing the short term scientific objectives appropriate for TFTR before its shutdown, which will be no later than mid-1998.

We are increasing support for alternative concepts which have fared well in peer reviews, including small devices at University of Wisconsin and University of Washington.

We are beginning new initiatives in plasma science, and plan to start our Principal Young Investigator Program in September 96, and joint initiative in Research Opportunities in Plasma Science with NSF in October 96.

• From the outside, the fusion program seems similar to last years, but it is undergoing a radical change. It is now a scientific program, intent on wringing the best remaining science from our past capital investments in facilities, while beginning new initiatives to expand the range of its scientific capabilities.

• This has been a year of difficult transitions. I would like to thank our dedicated and talented people - including many in this room - for their efforts in rebuilding our program.

• Their future, and that of the program is now in the hands of the Congress. We have replanned our program as the Congress asked. The President's budget requests the funds necessary to follow through on that plan. Another large Congressional cut will gut that effort, and defeat the key objectives of the program restructuring. It will also threaten our ability to fulfill existing international commitments, and cost us many of the human and physical assets which we have built up over decades. Once gone, these cannot be replaced overnight.

• Congress has hard decisions to make as we move toward a balanced budget, but further cuts in fusion are penny wise and pound foolish.

• There are members of Congress who are working for a strong, stable fusion science program. I thank them, and their staffs, for their efforts. I hope they can rebuild the bipartisan consensus which, until very recently, supported our work in fusion.

• In her remarks, Secretary O'Leary pointed out that young people like those in this room - smart, creative and curious - are the ones who will complete research now under way . If we are going to ask them to invest their lives in doing that, we must provide them with stable and exciting programs which will allow them to grow and contribute, whether in fusion, or other fields.